

DEVELOPMENT OF NUTRITIOUS COOKIES BY INCORPORATING KODO AND LITTLE MILLET FLOUR

P. HIMABINDU¹ & N. DEVANNA²

¹Research Scholar, Department of Food Technology, JNTUA, Anantapur, Andhra Pradesh, India

²Professor, Department of chemistry, JNTUA-College of Engineering, Anantapur, Andhra Pradesh, India

ABSTRACT

An experiment was under taken with an attempt to exploit the commercial use of Kodo and little millet, and to improve the nutritive value of the products developed from the kodo and little millet grains by incorporating butter and coconut powder. Kodo and little millet grains were malted by soaking in potable water for 18 hours, germination by 30 hrs followed by shade drying at room temperature

Two types of cookies were prepared in the present investigation: Attempts have been made to develop cookies by the addition of optimized proportions of malted kodo millet flour and little millet flour, refined flour, sugar, butter and coconut powder. Two varieties of cookies were prepared namely butter cookies and coconut cookies by using optimized proportions of kodo millet flour, little millet flour, refined flour and other ingredients like butter and coconut powder, sugar etc. Both two types of cookies i.e. butter cookies and coconut cookies are developed in three combinations of kodo millet flour, little millet flour and refined flour, in the ratio of 25:25:50, 30:30:40 and 35:35:30 respectively. The butter cookies and coconut cookies prepared in three combinations are evaluated by sensory panel. Results revealed that among all the formulations tried, the 35:35:30 flour combination cookies got higher sensory scores. So the samples with higher sensory scores are subjected to the further chemical analysis and shelf life studies. These samples contain higher values of protein, fiber, and minerals (i.e. Calcium, Iron and Phosphorous) than the control sample. The most acceptable samples are then packed in HDPE and subjected for storage study for a period of three months at cool and dry place at normal room temperature. Sensory scores shows decreasing trend in overall acceptability of the products with increase in storage.

KEYWORDS: Cookies, Kodo Millet Flour, Little Millet Flour, Millets & Malting

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INTRODUCTION

In recent years, millets are recognized as important substitutes for major cereal crops to cope up with world food shortage and to meet the demands of increasing population of both developed and developing countries (Rachie 1975). Millets are the group of highly variable small seeded grasses widely grown around the world as cereal crops or grains for fodder and human food. Millets are important crops in semiarid tropics of Asia and Africa (especially in India, Mali, Nigeria and Niger) with 97 % of millet production in developing countries. The crop favored due to its productivity and short growing season under dry, high-temperature condition. The kodo millet contains high amounts of polyphenols and antioxidant compounds. They also rich in fibre and low on fat. Kodo millet inhibited glycation and cross linking of collagen, which are good for diabetics (Crawford, GaryW & Lee, and Gyoung-Ah-2003). Little millet seeds are smaller than other millets like Foxtail millet. Little millet is high in iron content and high in fiber like kodo millet and high antioxidant activity. It helps diabetes and problems

related to stomach. Malting of grains causes a significant reduction in the anti-nutritional components thus improving the availability of nutrients of malt. Malting has also been reported to help increase the in vitro digestibility, improves the sensory quality and extends the shelf life of the product (sehgal et al., 2003). The iron content in kodo millet ranges from 25.86ppm to 39.60ppm (Chandel et al., 2014).

Malting serves the purpose of converting insoluble starch to soluble starch, reducing complex proteins, generating nutrients for yeast development, and the development of enzymes (Goldammer, 2008). Literature survey reveals that, malting has been the active and expedient way for value addition of cereals (Adeyemo, Olayode and Odutuga, 1992; Akpapunam, Igbedioh and Aremo, 1996).

MATERIALS AND METHODS

Kodo and little millet are procured from TIMBUCTU organization (Penukonda, Anantapur district) other ingredients like maida, butter; coconut powder, sugar etc are procured from local market. Kodo and little millet grains were malted by soaking in potable water for 18 hours, germination by 30 hrs followed by shade drying at room temperature, after complete drying grains are roasted for good flavor and powdered by using grinder. Two types of cookies namely butter cookies and coconut cookies were prepared by using combinations of malted kodo and little millet flour and other ingredients. Butter cookies were prepared by using three combinations of kodo and little millet flour and refined flour i.e. 25:25:50, 30:30:40 and 35:35:30 and by using other ingredients like butter(30gm), sugar(50gm), egg, baking powder, cardamom powder etc. Coconut cookies were also prepared in the same way by using the same ingredients and the extra ingredient used in coconut cookies was coconut powder (30gm).

METHOD FOR PREPARATION OF COOKIES

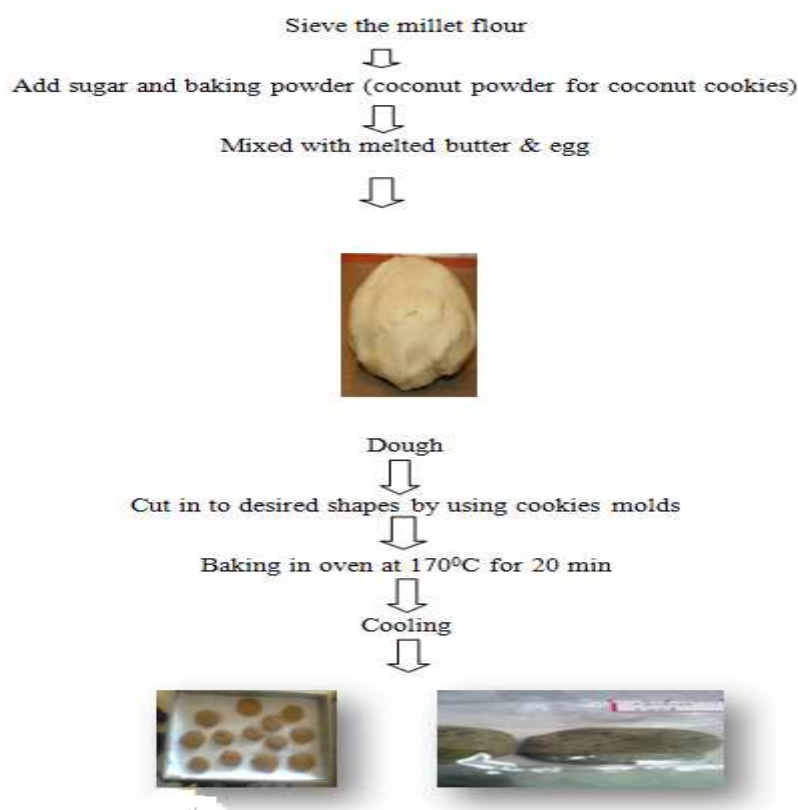


Figure 1

Testing Acceptability of the Product

Normal butter cookies with refined flour were taken as control. The experimental products along with control were evaluated, by a selected panel of 8 judges for their sensory characteristics by using composite scoring method (Amerine, et al., 1965). A score card was prepared separately for each type of malt mix and numerical scores were assigned for each attribute. The attributes considered during the study were flavor, taste, mouth feel, color, appearance and overall acceptability. Judges were to evaluate based on scores assigned. The best sample i.e. coconut cookies with 35:35:30 (kodo millet flour: little millet flour: refined wheat flour) was identified. This sample was subjected for further nutritional analysis and storage studies.

Nutrient and Physico-Chemical Analysis

The control (RFICC) and the most acceptable (MFICC) samples were analyzed for moisture, crude fiber and fat by using the method of AOAC,1990. The protein content was estimated using Lowry's colorimetric method and calculated as g% of protein (Lowry, et al., 1951). Carbohydrates are also determined by using the method of DGHS manual

Storage Studies

Packaging of most acceptable cookies was done in HDPE and laminated pouches and the samples were stored at ambient temperatures. The acceptability of the stored sample was evaluated by the same panel of judges selected earlier. A five point hedonic scale was used to rank each of the attribute of the products. Sensory evaluation was carried out periodically after 15, 30, 45 and 60 days during the 2 months storage period by the same panel of judges.

RESULTS AND DISCUSSIONS

Acceptability of the Product

The sensory evaluation of the newly developed products revealed that combination of 35:35:30 kodo, little and refined flour incorporated coconut cookies obtained least standard deviation (SD) among the normal butter cookies. So the most acceptable sample was selected for quality evaluation and storage studies.

Nutrient and Physico chemical Analysis

The result for the nutrient and physico-chemical analysis of refined flour coconut cookies (control) and most acceptable millet flour incorporated coconut cookies is present in **Table1** and **Figure 1**.



Figure 2

Table 1

| | Moisture (%) | Ash (%) | Fat (%) | Protein (%) | Iron(mg) | Crude Fibre % | CHO (%) |
|---------|--------------|---------|---------|-------------|----------|---------------|---------|
| control | 5.21 | 1.01 | 2.9 | 10.7 | 2.8 | 4.2 | 72.3 |
| Sample | 2.79 | 1.80 | 3.8 | 13.57 | 3.8 | 8.0 | 64.5 |

Values are means of two observations; Control normal coconut cookies, Sample most acceptable millet flour incorporated coconut cookies.

The carbohydrate content is low in sample when compared to control. This may be attributing to the higher protein content in the most acceptable sample than that of control.

Moisture content was decreased in the sample than that of control due to decrease of moisture up to 5%.A significant increase in the protein content was observed on malting of kodo and little millet and decrease in carbohydrates through oxidation during germination and loss of low molecular weight nitrogen and rising of grains.

The fat content was increased in sample due to incorporation of butter and coconut. The higher content of fat in butter and coconut could have resulted in higher value of fat obtained in the sample.

There was a significant increase in crude fiber in sample than that of control it may be due to the kodo millet is an excellent source of fiber. The ash content of the sample was increased compared to the control due to the addition of more ingredients like coconut powder etc.

Storage Studies: Table 2 indicates the results for mean scores for different attributes of sensory test and figure 2 shows the analysis of variance for overall acceptability of the stored products. The results for storage studies revealed that both the sample stored in laminated pouch and HDPE was acceptable up to 30 days. After one month the sample stored in laminated pouch got changes in taste and other attributes. The sample stored in HDPE was stable up to 60 days.

Storage studies also revealed that the sample packed in HDPE are more acceptable than that of packed in laminated pouches.

Table 2: Sensory Scores of Cookies

| Days | Flavour | Taste | Mouth Feel | Colour | Appearance | Overall Acceptability |
|------------------------------|---------|-------|------------|--------|------------|-----------------------|
| A- Sample in HDPE pouch | | | | | | |
| 15 | 4.4 | 4.6 | 4.8 | 4.8 | 4.6 | 4.64 |
| 30 | 4.2 | 4.6 | 4.6 | 4.4 | 4.0 | 4.36 |
| 45 | 3.8 | 4.0 | 4.2 | 4.0 | 4.0 | 4.00 |
| 60 | 3.4 | 3.8 | 4.0 | 4.0 | 3.8 | 3.80 |
| B- Sample in laminated pouch | | | | | | |
| 15 | 4.4 | 4.4 | 4.8 | 4.8 | 4.6 | 4.60 |
| 30 | 4.0 | 4.4 | 4.4 | 4.0 | 4.0 | 4.16 |
| 45 | 3.8 | 4.0 | 4.2 | 4.0 | 3.8 | 3.96 |
| 60 | 3.2 | 3.4 | 3.8 | 3.8 | 3.2 | 3.48 |

HDPE: High density polyethylene

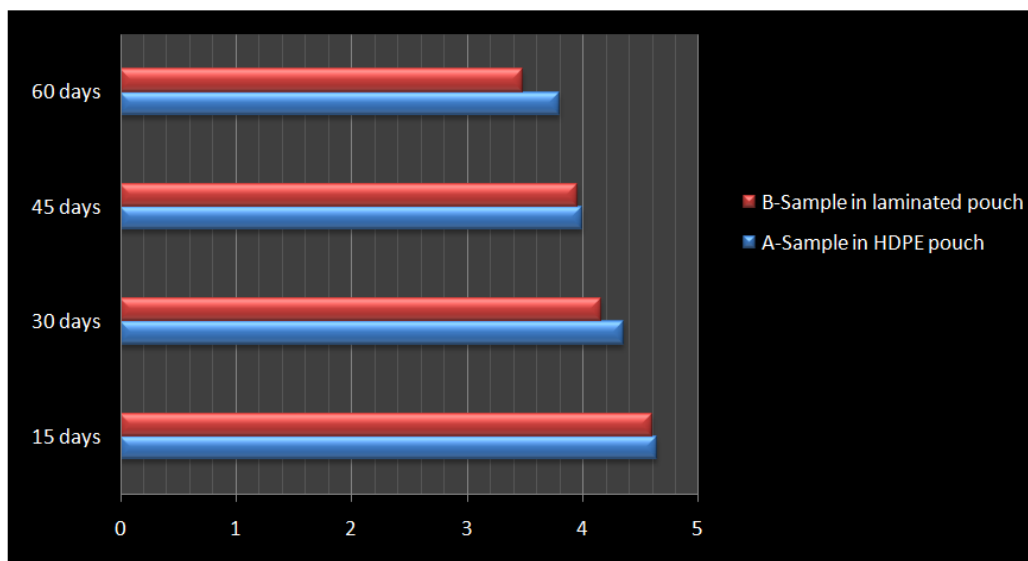


Figure 3: Shelf Life Studies of Sample

CONCLUSIONS

The present study concludes that millet (kodo & little) 35:35gms flour incorporated cookies prepared were found to be best combination with respect to sensory evaluation. With increasing health consciousness among people and increasing demand of foods which reduce the risk of diseases, there is tremendous scope and market opportunity for development of such value added products which could find commercial value. These cookies recommended as health foods for all age groups. Because consumption of nutrient dense foods such as those developed will not only help the nutritional status but also provide further health benefits.

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